

# (12) UK Patent Application (19) GB (11) 2 089 850 A

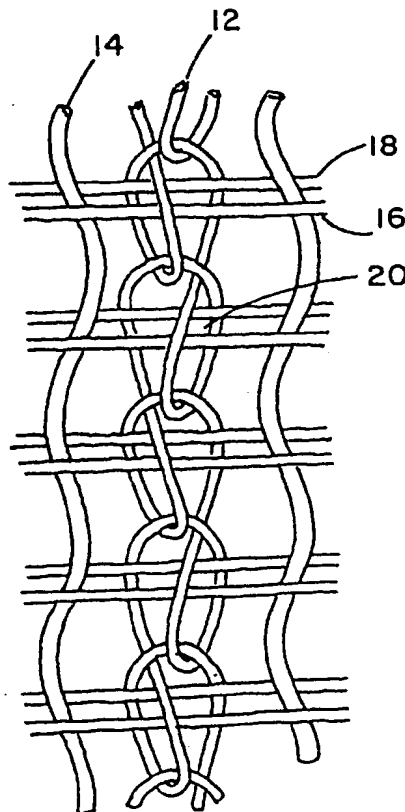
- (21) Application No 8123318  
(22) Date of filing 30 Jul 1981  
(30) Priority data  
(31) 217291  
(32) 18 Dec 1980  
(33) United States of America (US)  
(43) Application published 30 Jun 1982  
(51) INT CL<sup>3</sup>  
D04B 21/18  
(52) Domestic classification  
D1K 24A11 24A6 24A9 24B2  
(56) Documents cited  
GB 2062033A  
GB 2023678A  
GB 1581295  
GB 1357024  
GB 284538  
US 4173131A  
(58) Field of search  
D1K  
(71) Applicants  
The Kendall Company,  
One Federal Street,  
Boston, Massachusetts,  
United States of America  
(72) Inventors  
John Edwin Pendergrass,  
David Troy Melton  
(74) Agents  
Brewer & Son,  
5—9 Quality Court,  
Chancery Lane, London  
WC2A 1HT

## (54) Warp-knitted elastic bandage

(57) A lightweight, porous knitted elastic bandage has a warp consisting of a set of texturized yarns 12 knit in a chain stitch and a set of texturized float yarns 14, both sets being held together by two sets of inelastic filling

yarns 16, 18. The filling yarns are deployed in a regular and repeated pattern across the width of the bandage, and are interlaced with the loops of the chain stitch yarns, one set of filling yarns passing over and the other below the float yarns without being interlaced therewith.

FIG. 5



GB 2 089 850 A

1/1

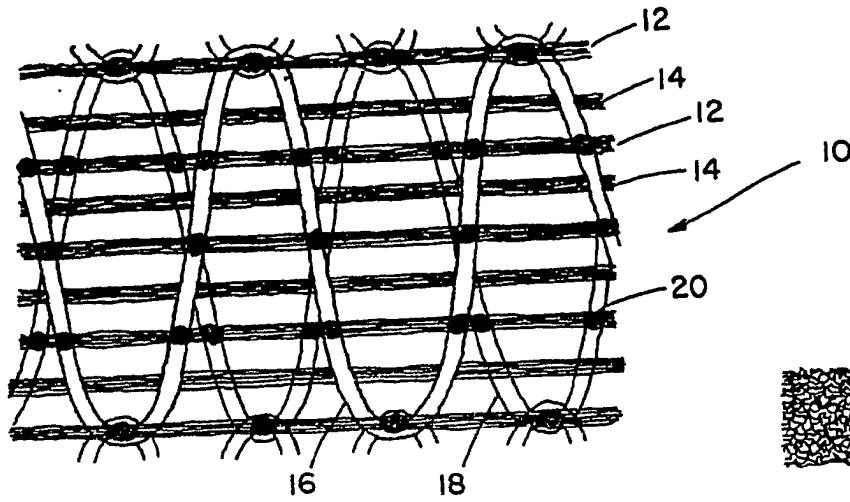


FIG. 1

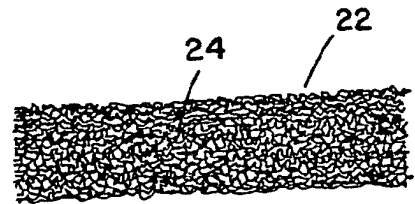


FIG. 2

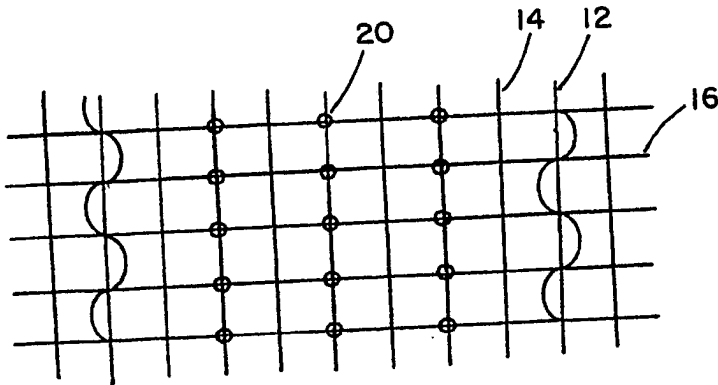


FIG. 3

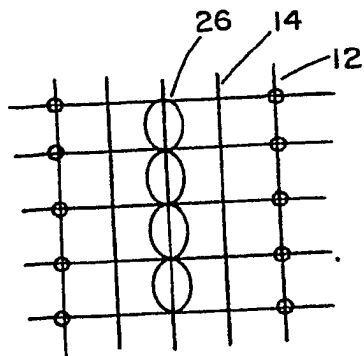


FIG. 4

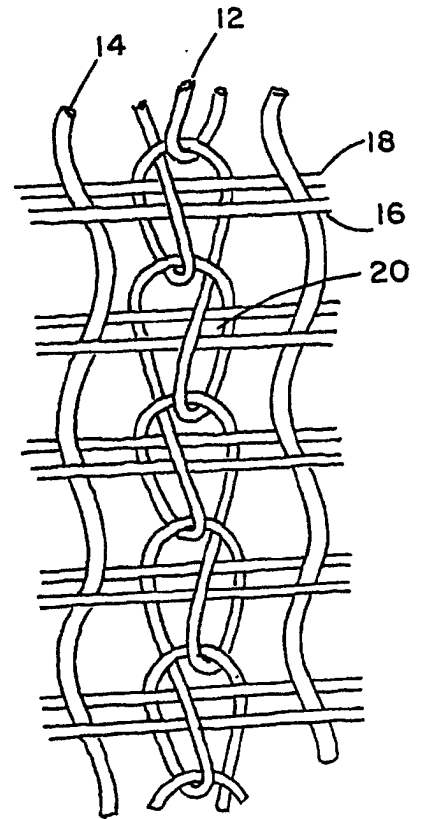


FIG. 5

## SPECIFICATION

### Knitted elastic bandage

Elastic bandages have in the past been made by weaving on narrow or ribbon looms, the retractive and supportive power being supplied by special warp yarns. Early bandages employed overtwisted cotton warp yarns, but the use of cotton warp yarns has been displaced to a considerable extent by the use of elastomeric warp yarns, initially made of extruded or cut rubber but more recently of elastomeric manmade polymers. Such elastomeric warp yarns are usually wrapped with a layer of nonelastomeric filaments.

Such bandages, although effective in use, suffer from the disadvantage of being relatively expensive. They are produced singly on a narrow loom, utilizing expensive wrapped elastomeric yarns, at comparatively slow production rates inherent in the weaving process.

In an attempt to circumvent the limitations of the weaving process, it has been proposed to produce knitted elastic bandages.

Most of the knitted bandages which have been proposed employ elastomeric yarns as part of the warp structure and customarily employ very heavy filling yarns to prevent necking-in of the bandage when stretched. They are relatively heavy in weight, averaging 204 to 408 grams per square metre, and due to their compact structure they become hot and uncomfortable to wear.

In U.S. Patent No. 4,173,131, we have described the production of a lightweight elastic bandage in which the warp yarns consist of a set of false-twist yarns formed into stitch loop chains, each of said yarns having inlaid therein a second false-twist yarn of opposite direction of twist. The filling yarns are deployed across the warp yarn in varied and cursive patterns across the warp yarns, so that overlying layers of the bandage cling to each other in relatively non-displaceable relationship.

Bandages of this nature, while eminently satisfactory in use, are relatively complex to manufacture due to the necessity of forming every warp yarn into chain-stitch configuration with a second warp yarn inlaid therein and to the intricate pattern of the filling yarns.

The present invention provides a warp knitted elastic bandage, which comprises a set of texturized parallel warp yarns formed into chain-stitch loops, a set of texturized float yarns which extend parallel to said set of warp yarns but are not connected thereto, and two sets of inelastic filling yarns which are deployed in a regular and repetitive pattern across the width of the bandage, the filling yarns being interlaced with the loops of some at least of the chain-stitch warp yarns and one set of filling yarns passing over and the other under the float yarns without being interlaced therewith.

The elasticity of the bandage according to the invention is provided by the inherent elongation and recovery of texturized warp yarns. Such yarns are continuous filament yarns which have been

given increased bulk and loft, together with recoverable stretch, by the introduction into the yarn of crimps, loops, coils and crinkles by false-twisting. Such yarns are commercially produced by well-known processes, and when the

filamentary material is thermoplastic, as is the case with nylon or polyester, a heat-setting stage in the false-twist process renders the stretch and the crimped configuration of the yarn relatively permanent.

The yarn may be twisted clockwise or anticlockwise in the false-twist process to produce so-called S or Z twist yarns. In most lightweight bandages it is desirable to use a substantially balanced number of S and Z twist yarns in the warp to minimize the tendency of the bandage to twist when unrolled.

To minimize the tendency of the bandage according to the invention to twist or curl, it is preferred that there be substantial equality in the torque contributed by S-twist and by Z-twist yarns forming the total warp of the bandage. This may be effected in various ways, as set forth in more detail below.

A preferred embodiment of knitted elastic bandage according to the invention is illustrated in the accompanying drawings, in which:—

Figure 1 is a magnified isometric view of one repeat of the basic structure of the bandage,

Figure 2 is a magnified cross-sectional view of a false-twist warp yarn,

Figure 3 represents schematically the paths of the warp yarns and one set of filling yarns in the segment of bandage shown in Figure 1,

Figure 4 represents the paths of both sets of filling yarns interlacing with a warp yarn, and

Figure 5 represents in magnified detail the interlacing of both sets of filling yarns with a warp yarn formed into a chain stitch.

Figure 1 shows one repeat of a bandage 10, which comprises two sets of warp yarns, 12 and 14, both of which are of texturized nature and capable of elongation. Each yarn 12 is formed into a series of chain-stitch loops as shown in Fig. 5, and two inelastic filling yarns 16 and 18 are inlaid in each of its loops as indicated at 20. Each yarn 14 is a float yarn, which merely passes between the filling yarns 16 and 18 and is not interknitted with the other yarns of the bandage. The float yarns add stability to the bandage and increase the cover factor (i.e. the number of yarns per inch divided by the square root of the yarn size). The preferred range of combined chain-stitch and float yarns is from 20 to 40 yarns per inch, and these yarns preferably range in size from 70 denier to 230 denier.

Both the chain-stitch yarns 12 and the float yarns 14 may be mixed S-twist and Z-twist. They are not necessarily drawn in strict alternation, since a beam of S yarns and a beam of Z yarns may be intermingled randomly to provide a stable torqueless bandage provided that the number of yarns of each type of twist is substantially equal. Also, it is not essential that there be an equal number of float and chain-stitch yarns in

alternation across the width of the bandage. Since the primary function of the float yarns is to impart stability and weight to the bandage, the ratio of chain-stitch yarns to float yarns may vary from two or more to one to one to two or more depending on the size of the yarns.

Alternatively, a more convenient method of balancing S-twist and Z-twist yarns is to have all the chain-stitch warp yarns of one type of twist and all the float yarns of the opposite twist. This is the preferred method when there are approximately equal numbers of chain-stitch and float yarns, of similar degrees of twist.

While in Figure 1 the filling yarns 16 and 18 are shown as being inlaid at 20 in the loops of all the chain-stitch yarns 12, this is not essential. The principal function of the filling yarns, apart from holding the warp yarns in an integral structure, is to provide transverse stability and resistance to narrowing of the bandage when stretched. This will vary with the size and number of the filling yarns, which are preferably cotton yarns of a size ranging from 10/1 to 30/1, with from 10 to 20 filling yarns per inch of bandage length.

The filling yarns are deployed in a regular and repeated pattern across the width of the bandage, each filling yarn preferably extending over from 5 to 9 warp yarns.

As shown in Figure 2, each warp yarn is a false twist yarn 22 with texturized filaments 24. Figure 3 shows diagrammatically how the filling yarns 16 are inlaid at 20 in the loops of the warp yarns 12. Figure 4 illustrates interlacing of both filling yarns 16 and 18 with the warp yarns 12 at 26.

The bandage may be made on a crochet machine, utilizing three yarn guide bars per repeat operating in a vertical plane perpendicular to the horizontal needles of the machine. Two of the bars are moved across the width of the bandage to insert the filling yarns 16 and 18 of 20/1 cotton, and the third bar is utilized to insert the texturized float yarns 14, which are about 140 denier Z-twist texturized and heat set nylon. The chain stitch yarns 12 are of similar denier, but S-twist. As shown in Figure 1, there are five chain-stitch yarns and four float yarns per full repeat of the pattern. The filling yarn pattern is that shown in Figures 1 and 3, in which all the cotton filling yarns 16 and 18 interlace with each of the chain-stitch warp yarns 12, but merely pass over or under the float yarns 14 without being interlaced therewith. There are 18 filling picks per inch of bandage length.

Since the bandage as formed on the machine has a degree of stress due to the tensions applied to the various yarns during processing, it was conditioned by exposing it to moist steam at 80°C for about two minutes, after which it was dried. The weight of the dried and relaxed bandage was 140 grams per square metre.

The finished bandage had an air porosity of over 700 cubic feet of air per square foot per

minute at 0.5 inches pressure, as tested on the Frazier Air Permeability apparatus. At 100% elongation, the bandage had 9 picks, or filling yarns, per inch. The filling cover factor was therefore 2 (9/square root of yarn size, 20). This is a very low cover factor, characteristic of open-mesh netting. Coupled with the fuzzy, dispersed configuration of the texturized warp yarns, it ensures a breathability and comfort in use that is not found in conventional elastic bandages.

In addition to being light in weight and comfortable to wear, the bandage according to the invention is absorbent and may be washed and sterilized without degradation. Since it contains no rubber or synthetic elastomeric material, it may be used in cases where elastomeric yarns in contact with the skin give rise to an allergenic reaction.

It will be appreciated by those skilled in the art that, unlike the production of woven bandages on a narrow loom, the knitted bandages according to the invention may be produced on a wide flat-bed machine and a plurality of bandages, of varying widths if desired, may be produced in a single machine operation using a tie-in yarn between individual bandages if necessary. The tie-in yarns may be produced by needles which run to and fro between adjacent bandages and may be readily removed subsequently by an unravelling operation.

#### CLAIMS

1. A warp knitted elastic bandage, which comprises a set of texturized parallel warp yarns formed into chain-stitch loops, a set of texturized float yarns which extend parallel to said set of warp yarns but are not connected thereto, and two sets of inelastic filling yarns which are deployed in a regular and repetitive pattern across the width of the bandage, the filling yarns being interlaced with the loops of some at least of the chain-stitch warp yarns and one set of filling yarns passing over and the other under the float yarns without being interlaced therewith.

2. A bandage according to claim 1, wherein the number of chain-stitch warp yarns is substantially equal to the number of float yarns.

3. A bandage according to claim 2, wherein the chain-stitch yarns and the float yarns alternate across the width of the bandage.

4. A bandage according to claim 1, wherein the total number of chain-stitch warp yarns and float yarns contains a substantially equal number of yarns of S-twist and yarns of Z-twist.

5. A bandage according to claim 2, wherein the float yarns and the chain-stitch yarns are of opposite twist.

6. A bandage according to claim 1, wherein the filling yarns interlace with the loops of all of said chain-stitch yarns.

7. A bandage according to claim 1, in which the texturized warp yarns are of heat-set thermoplastic material.

8. A bandage according to claim 1, in which the sets of filling yarns are deployed over from five to nine warp yarns.

9. A bandage according to claim 1,  
5 substantially as described herein with reference to the accompanying drawings.

---

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1982. Published by the Patent Office,  
25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

**PAGE BLANK (USPTO)**